Halifax Airport Pavement Management System Implementation

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1 Introduction/Background



Background

Location

 Halifax Robert L. Stanfield International Airport (HSIA), Ensfield, NS, opened June 1960

Management

• Halifax International Airport Authority (HIAA), since February 1, 2000





Passengers

- 17 scheduled and charter passenger air carriers
- 45 destinations with direct service (20 in Canada, 8 in United States, 17 in international markets)
- 3.9 million enplaned/deplaned passengers (2016)







Cargo

- 32,020 metric tonnes in 2015/2016
- Major exports: seafood, electronics, machinery, and industrial equipment (~\$470 million in 2015)



Air Terminal Building

- 32 operational gates
- 13 loading bridge positions
- Accommodates all jets up to B747





https://halifaxstanfield.ca/airport-authority/media-centre/airport-facts-and-stats/airport-specs/

Airside Infrastructure

- Main runway 05/23
 - 10,500 ft (3,200 m) x 200 ft (61 m)
- Secondary runway 14/32
 - 7,700 ft (2,347 m) x 200 ft (61 m)
- Taxiways: A to H, J, K, M
- Aprons: North, Center, South, De-icing Bays







Project Outline

- Manual Distress Survey (Pavement Condition Index – PCI)
- Deflection Testing (Heavy Weight Deflectometer – HWD)
- Pavement Management (PMS) Implementation
- 10-Year Work Plan



Airside Infrastructure

Runways

- 05-23
- 14-32

Taxiways

- Alpha
- Bravo
- Charlie
- Delta
- Echo
- Foxtrot
- Golf
- Hotel
- Indigo
- Juliet
- Kilo
- Mike

Aprons

- North Apron
- Center Apron
- South Apron
- De-icing Bays





Network Sectioning



Stantec

Visual Distress Survey

ASTM D5340 Manual Survey

- Evaluate pavement distress severity and extent
- Sampling method
- December 2015

Pavement Condition Index (PCI)

• ASTM PCI with modifications for weathering/raveling



ASTM PCI Condition Categories

PCI	Condition			
86 - 100	Good			
71 – 85	Satisfactory			
56 – 70	Fair			
41 – 55	Poor			
26 – 40	Very Poor			
11 – 25	Serious			
0 – 10	Failed			











Photo Credit: http://www.acmarc.com/pits/pits8-8-10.html

Deflection Testing

Transport Canada AC 302-011

- Runways and taxiways only
- Two passes with 3 m offset
- 200 m interval



Heavy Weight Deflectometer (HWD)





Deflection Testing

HWD Analysis

- Normalized Deflection (D1)
- In-situ Subgrade Resilient Modulus (M_R)
- Effective Pavement Modulus (E_P)
- Modulus of Subgrade Reaction (K_{static})
- Elastic Modulus of Concrete (E_{PCC})
- Effective Slab Thickness (D_{eff})
- Effective Structural Number (SN_{eff})
- Pavement Load Rating (PLR)/Pavement Classification Number (PCN)







Deflection Results

Runway	CL	# of Test	Pvt	Maximum Normalized Deflection D ₁ (µm)	Subgrade Resilient Modulus M _R (MPa)	Effective Pavement Modulus (E _p)	Effective Structural Number SN _{eff}	Modulus of Subgrade Reaction K _{static} (MPa/m)	Elastic Modulus of Concrete E _{pcc} (MPa)	Effective Slab Depth (mm)
RUNWAY 05-23	R	69	СО	130	83	1,831	289	90	4,871	134
	L	64	СО	145	87	1,399	283	97	4,105	120
	R	5	PC	39	-	-	-	83	22,383	309
	L	7	PC	45	-	-	-	63	27,373	326
RUNWAY 14-32	R	46	AC	222	111	674	233	-	-	-
	L	44	AC	202	101	800	244	-	-	-
	R	15	СО	205	195	2,412	187	97	3,456	112
	L	13	СО	214	192	2,363	183	96	3,789	109



MicroPAVER Pavement Management System

- Network Definition
- Survey/Condition Data
- Prediction Models (Deterioration Curves)
- Maintenance and Rehabilitation Treatments
- Budgets



Budget or "What-If" Scenarios

Do Nothing Budget

• Highlights the detrimental effect of not spending any money on airfield pavements.

Steady State

• Identifies the cost to maintain the existing network PCI at its current condition.

Improved Network State (PCI 65)

- Identifies the cost to maintain the network at a PCI of 65.
- Improved Runway State (PCI 70 Rwy)
 - Identifies the cost to maintain the runway network at a PCI of 70.
- Improved Taxiway State (PCI 60 Twy)
 - Identifies the cost to maintain the taxiway network at a PCI of 60.
- Improved Apron State (PCI 55 Apron)
 - Identifies the cost to maintain the apron network at a PCI of 55.

Unlimited Budget

 Assumes unlimited funding over the analysis period, which represents the theoretical maximum value HIAA would spend to keep all its field pavements in good condition.

Impact of Budgets on PCI





10-Year Work Plan Development

- Period: 2016 2025
- Based on results from network-level work program analysis AND operational input



4 Lessons Learned



Lessons Learned/Take-Aways

- PCI = standardized method, but can be customized to suit environment
- Network-level assessments are NOT the same as project-level assessments
- Work program provides guidelines based on cost-effective, but also needs to consider other factors, like operational impacts



Questions?

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